INFLUENCE OF LEARNER-CENTRED STRATEGIES ON STUDENTS' BIOLOGY PERFORMANCE IN KENYA CERTIFICATE OF SECONDARY EDUCATION IN KINANGOP SUB-COUNTY, NYANDARUA COUNTY, KENYA

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DECLARATION

This research project is my original work and has not been presented for a degree in any other university

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I dedicate this work to my mother Margaret Wangeci, my brother Peter, my sisters Teresiah, Josephine and Grace.

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ABBREVIATIONS AND ACRONYMS

ASEI	Activity, Student, Experiment and Improvisation
CEMASTEA	Centre for Mathematics, Science and Technology Education in Africa
DEO	District Education Office
INSET	In-Service Training
JICA	Japan International Co-operation Agency
KCSE	Kenya Certificate of Secondary Education
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examinations Council
MoEST	Ministry of Education, Science and Technology
OECD	Organization for Economic Co-operation and Development
PDSI	Plan, Do, See, Improve
PISA	Programmes for International Students Assessment
SESEMAT	Strengthening Education in Secondary Education Mathematics and Technology
SMASSE	Strengthening mathematics and Sciences in Secondary Education
SPIAS	SMASSE Project Impact Assessment Survey
SPSS	Statistical Package for Social Sciences
WECSA	Western, Eastern, Central and Southern Africa

ABSTRACT

The purpose of the study was to investigate the influence of learner-centred strategies on students' biology performance in Kenya Certificate of Secondary Education in Kinangop sub-county, Nyandarua County. The study aimed to achieve this by assessing the extent to which ASEI strategy, PDSI strategy, as well as teachers' attitudes towards leaner-centred strategies influenced students' biology performance in KCSE. Jean Piaget's theory of intellectual development which explains that individuals are curious, active and inventive throughout their lives was used for the study. The study adopted a descriptive survey design and targeted 15 public schools, 32 biology teachers and 1152 form four biology students. The study sampled 10 schools, 20 biology teachers and 230 form four biology students. The study adopted purposive sampling techniques for schools because only ten schools had presented candidates for KCSE before introduction of SMASSE INSET. Simple random sampling was employed for teachers and students as it is simple and saves time. Before the actual data collection procedure, a pilot study was conducted in two schools using four teachers and twenty students to check the reliability and validity of the instruments. The data obtained was used to compute the correlation coefficient which was 0.88 for the teacher and 0.92 for the student. Data collection instruments included questionnaires for biology teachers and biology students.

Data analysis involved both quantitative and qualitative techniques. Data was presented in frequencies and percentages in the form of tables and figures. The study ratings revealed that only 40 percent of the schools had implemented ASEI strategy. Majority (80 percent) of the schools were applying PDSI strategy partially with a mean score rating of 20.9.The study further revealed that attitude of teachers towards learner-centred strategies was positive with a mean rating of 32.5. Among the major challenges that affect implementation of ASEI/PDSI strategies were insufficient time, large class size, heavy teaching load and pressure to cover syllabus. The study concluded that learner-centred strategies had influenced students' biology in KCSE and that low level of implementation of ASEI and PDSI strategies coupled with negative attitude of biology teachers towards leaner-centred strategies has contributed to declining trends in performance. The study recommended that readily prepared lesson plans be provided by CEMASTEA to ensure that lessons are delivered SMASSE way due to the fact that teachers lacked adequate time to prepare lesson plans. The study also recommended that schools Board of Management should hire trained teachers to supplement the ones posted by Teachers' Service Commission. The study also recommended that the Ministry of Education should establish routine inspection to ensure that ASEI/PDSI strategies are practised as expected. The study recommended that further research be done to identify institutional factors that hinder implementation of learner-centred strategies.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

In-service training is a universally recognized activity for promoting effectiveness in service delivery. In his analysis of lists of the characteristics of effective professional development, Guskey (2004) found out that the main characteristic of effective professional development is enhancement of teachers' content and pedagogic knowledge. Guskey's thinking is in line with that of Zalasvky and Leikin (2004) who argue that improving students' learning depends on a teaching force with appropriate beliefs and attitudes towards teaching and learning; and who posses content and pedagogical knowledge quite distinct from the usual instructional practice in most classrooms.

Globally, most countries such as Canada, Israel and Kenya are investing a lot in teacher in-service training to improve quality and relevance of Education (Ogwel & Kisangi, 2009). Desimone (2009) enumerates some characteristics of professional development that are critical to increasing teacher knowledge and skills, improving their practice, and which hold promise to increasing student achievement. These include content focus, active learning, coherence, duration, and collective participation. It is against this backdrop that Kalai (1998) asserts that professional proficiency can only be realized through participant involvement in the programme design and evaluation.

Stigler and Hiebert (1999) observe that Japan has a history of in-service teacher training experience of linking mathematics and science education to industrial applicability. The achievement of the Strengthening of Mathematics And Sciences in Secondary Education (SMASSE) project in Japan and the Philippines attracted a number of the development bodies such the Association for the Development of Education in Africa (ADEA) and the New Partnership of Africa's Development (NEPAD) where the latter signed a letter of understanding with SMASSE-Western, Eastern, Central and Southern Africa (WECSA) to jointly develop activities in relation to strengthening of mathematics and science in secondary education in Africa (SMASSE, 1999).This led to development of initiatives like SMASSE-Kenya, SMASSE-Niger, SMASSE-Malawi, SMASE-Nigeria, SESEMAT-Uganda and SMASTE-Zambia (Ogwel & Kisangi, 2009).

The Strengthening of Mathematics and Science (SMASSE) project was launched in July 1998 as a joint venture between the government of Kenya through Ministry of Education Science and Technology (MoEST) and the government of Japan through Japan International Co-operation Agency (JICA, 2007). The overall goal of the SMASSE project is to upgrade the capabilities of young Kenyans in mathematics and science education. The project has identified Activity Student Experiment and Improvisation (ASEI) and Plan Do See Improve (PDSI) strategies for enhancement of classroom practices for quality teaching and learning of biology.

The Programme for International Students Assessment (PISA) results of 2003 show that there is a close correlation between the teaching techniques and the performance of learners (OECD, 2004). Poor and declining performance trends observed in the science subjects over the years in Kenya has been blamed on many factors. From the baseline study carried out in 1998 in nine pilot districts by SMASSE, Kimani (2010) notes that teaching methodology was identified as the major factor hence the focus on ASEI-PDSI between 1999 and 2013 nationally. The table below shows Biology national percentage mean scores.

Table 1.1: Biology national performance 1999-2013

Year	1999	2000	2001	2002	2003	2008	2009	2010	2011	2012	2013
Mean score	30.2	27.8	27.5	29.5	36.2	30.32	27.1	29.2	32.4	31.6	32.3

Source: KNEC Reports (2000-2013)

From the data in the Table 1.1, it is evident that the national performance of students in biology KCSE is well below average which is 50 percent. SMASSE project was an intervention to address poor performance in mathematics and science subjects in Kenya Certificate of Secondary Education (KCSE) examination. The first, second and third phases of SMASSE project began in 1998, 2003 and 2009 respectively (CEMASTEA, 2012).

The SMASSE INSET in Kinangop Sub-county was started in 2004 and ended in 2007. The biology teachers were offered the in-service course for a period of four years of one cycle of ten working days each year.

The table below shows Kinangop Sub-county KCSE percentage mean scores in Biology between 1999 and 2012.

Table 1.2: Biology performance in Kinangop Sub-county 1999-2013

Year	1999	2000	2001	2002	2003	2008	2009	2010	2011	2012	2013
Mean Score	26.7	24.25	32.75	28.0	31.17	35.75	37.17	39.17	43.42	43.33	43.81

Source: DEO Kinangop Sub-county, 2014

The results above show that biology mean score is below average which is 50. Biology was selected for this study because it has continuously registered increased enrolment despite the minimal performance. Similar results were observed in a research conducted in Bomet by Rotich (2012) which revealed that performance of students in biology KCSE examination improved significantly after the introduction of SMASSE INSET. However, the study revealed that the performance of students in biology before and after SMASSE INSET has been below average (50 percent). The researcher therefore wishes to determine the influence of learner centred strategies on biology performance in Kinangop Sub-county.

1.2 Statement of the problem

Prior to the introduction of the SMASSE programme in Kinangop Sub-county the biology performance trend was similar to that of the nation with mean scores below average. Despite the rationale for the introduction of SMASSE programme in Kenya, to improve the performance of students in mathematics and sciences, performance in these subjects in secondary schools is still worrying as the largest percentages of candidates still obtain low grades of D+ and below.

Studies conducted by Rotich (2012), Ndirangu (2006) and Ombati (2009) reveal that performance of students in biology before and after SMASSE programme has been below average; students' involvement during the lesson has been partially achieved; and that classroom practices have improved but have however, not translated into improved performance of the subject. There has been minimal improvement in performance in biology after introduction of SMASSE in-service training in Kinangop District. It is therefore necessary for a study to be conducted to investigate the influence of learner-centred strategies on students' biology performance in public secondary schools in Kinangop Sub-county from the year 2008 to date.

1.3 Purpose of the study

The purpose of the study was to investigate the influence of learner-centred strategies on students' biology performance in Kenya Certificate of Secondary Education in Kinangop Sub-county, Nyandarua County, Kenya.

1.4 Objectives of the study

In order to fulfil its purpose, the study was guided by the following research objectives:

i) To establish the extent to which the Activity Student-centred Experiment Improvisation strategy influences students' performance in biology in KCSE in Kinangop sub-county.

ii) To examine the extent to which the Plan, Do, See and Improve approach influence students' performance in biology in Kenya Certificate of Secondary Education in Kinangop sub-county.

iii) To determine the extent to which teachers' attitude towards learner-centred strategies influence students' performance in biology in Kenya Certificate of Secondary Education in Kinangop sub-county.

iv) To identify the challenges of implementing learner-centred strategies in biology in Kinangop sub-county secondary schools.

1.5 Research questions

To meet the said objectives, the study was guided by the following research questions:

i) To what extent does the Activity Student-centred Experiment and Improvisation strategy influence students' performance in biology in Kenya Certificate of Secondary Education in Kinangop sub-county?

ii) To what extent does the Plan Do See Improve strategy influence students' performance in biology in KCSE in Kinangop sub-county?

iii) To what extent do teachers' attitudes towards learner-centred strategies influence students' performance in biology in Kenya Certificate of Secondary Education in Kinangop sub-county?

iv) What are the challenges of implementing learner- centred strategies in biology in Kinangop sub-county secondary schools?

1.6 Significance of the study

The outcome of this study may be important to the Kinangop sub-county Education office in determining the extent to which SMASSE objectives have been achieved. The findings of the study may enlighten the Kinangop sub-county SMASSE co-ordinators on how best to offer in-service courses in pedagogy for the teachers of biology so as to improve their teaching

experiences. In addition, the findings may be used by biology teachers to improve on their weaknesses in curriculum implementation and consequently improve their biology performance.

1.7 Limitations of the study

Limitations are challenges anticipated or faced by the researcher (Kombo & Tromp, 2006). The research covered only one sub-county which may have unique settings hence the study could not be used to generalize results to the whole country. For more conclusive results, all the sub-counties in Kenya should be studied. However this is not possible due to research constraints imposed by time, cost or availability of materials.

1.8 Delimitations of the study

The study only covered public secondary schools within Kinangop Sub-county of Nyandarua County. The study was limited to those public schools that had presented candidates for KCSE at least five years before the commencement of SMASSE program in the Sub-county for purposes of comparison. The study only considered Biology teachers who attended SMASSE INSET and were teaching by then.

1.9 Basic assumptions of the study

This study assumed the following:

i) That all the biology teachers under study were professionally qualified.

ii) That all the biology teachers had successfully undergone the four cycles of SMASSE in-service training.

iii) That local materials for improvisation were readily available.

1.10 Definition of significant terms

This study gave the following terms operational definitions:

ASEI teaching strategy refers to a movement that advocates for activity focused teaching/learning, student centred learning, experiments and improvisation.

Influence of learner-centred strategy refers to the effect of the teaching and learning strategy on students.

In-service training refers to any program of systematized activities that enhance effectiveness and efficiency of practicing teachers.

Learner-centred teaching and learning strategies refers to Activity Student-centred Experiment and Improvisation (ASEI).

Performance refers to the grades obtained by candidates in biology examination.

Pilot districts refer to the nine districts in which SMASSE was first conducted before being rolled out to the rest of the schools in Kenya.

Plan Do See Improve (PDSI) refers to an approach that aims at helping teachers practice Activity Student Experiment Improvisation (ASEI) at the classroom level (CEMASTEA, 2008).

Pre-service refers to the initial teacher education done either in a university or college before commencing teaching.

Strengthening Mathematics and Sciences in Secondary Education refers to an in-service course for secondary school teachers of mathematics and sciences.

Training refers to the process of bringing professional teachers to an agreed standard of proficiency through practice and instruction on Activity Student-centred Experiment and Improvisation.

1.11 Organization of the study

This study was organized into five chapters. Chapter one was an introduction focusing on the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study, delimitations of the study, basic assumptions of the study and definition of significant terms. Chapter two explored the reviewed literature on the concept of In-service Training, the ASEI practice, the PDSI approach, attitude of students towards biology, performance of biology in secondary schools, challenges of implementing ASEI and PDSI teaching strategies, summary of literature review as well as theoretical and conceptual framework of the study.

Chapter three dealt with research methodology under the sub-headings introduction, research design, target population, sampling technique and sample size, research instruments, instrument validity, instrument reliability, data collection procedures and data analysis techniques. Chapter four comprised of data analysis, presentation, interpretation and discussion of findings. Chapter five presented a summary of the findings, conclusion, recommendations and suggestions of researcher for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter consists of related literature reviewed under the sub-headings; the concept of in-service training, the Activity Student-centred Experiment and Improvisation practice and performance in biology, the Plan Do See and Improve approach and performance in biology, teachers' attitude towards ASEI/PDSI strategies and performance in biology as well as challenges of implementing Activity Student Experiment and Improvisation and Plan Do See and Improve strategies. The chapter also contains a summary of literature review as well as theoretical and conceptual framework of the study.

2.2 The concept of in-service training

Organization of Economic Co-operation and Development (OECD) project of 2004 defines in-service as those education and training activities engaged by primary and secondary school teachers and principals following their initial professional certificates and intended mainly or exclusively to improve their professional knowledge, skills and attitudes in order for them to be able to educate children more effectively (OECD, 2004). It has been argued that most teachers underwent traditional didactic instruction during the initial training and hence the need to expose them to new methods of teaching (Ndirangu, 2006). She further emphasizes the need to critically look into the teaching methodologies and strategies employed by the teachers through in-service training.

Bamett and Hodson (2001) articulated a theoretical framework that promoted the study of teachers' pedagogical content knowledge as a means for understanding what science teachers know and how they use that knowledge for teaching. This framework included four overlapping dimensions that provide a context for teachers' development; (a) pedagogical content knowledge, (b) professional knowledge, (c) classroom knowledge, and (d) academic research and knowledge. Pedagogical knowledge includes such things as knowing how to set teaching goals, organize a sequence of lessons into a coherent course, conduct lessons, introduce particular topics and allocate time for satisfactory treatment of all significant concepts. Academic and research knowledge for teachers refers to content knowledge in the subject, including the nature of science.

Brendzel (2005) notes that Japanese have been successful in teaching science using a model that employs guided interactive demonstrations rather than hands on experiments. He argues that this approach of teaching science probably arose from the fact that the Japanese system has very large classes (from 50-70 students) and teachers have more preparation periods to work together to prepare these demonstrations. Brendzel (2005) further notes that the America's model for effective teaching currently employs the active participation paradigm. The standards for science teaching emphasize the need to teach children not only through the use of activities but also through the use of critical thinking.

In Kenya, the Ministry of Education (MoE) is charged with the responsibility of maintaining standards in education. The efforts of in-servicing teachers are done through the institution within the ministry and with donor supported projects and non-governmental organizations. All the in-servicing courses are given value by the ministry to ensure that the providers give very high quality courses (MoE, 2002). The Centre for Mathematics, Science and Technical Education in Africa (CEMASTEA) conducts in-service training for mathematics and science teachers through programmes such as Strengthening Mathematics and Sciences in Secondary Education (SMASSE) which aims at upgrading the capability of Kenyans in mathematics and sciences (SMASSE 2004).

2.3 The Activity Student Experiment Improvisation (ASEI) practice and performance in biology

Activity, Student, Experiment and Improvisation (ASEI) approach endeavours to shift teaching and learning from knowledge-based teaching to activity-based learning, teacher-centred teaching to student-centred learning, theoretical (chalk and talk) to experiment and research-based approach, and recipe-type to scaled-down experiments with improvisations (CEMASTEA, 2012). The first component (A) of ASEI, aims at helping teachers appreciate the benefits of active learner involvement in the teaching and learning process. Teachers are guided on how to use a variety of activities for effective lesson delivery. Gachenga (2007) notes that the use of practical activities in learning needs to be emphasized.

The second component (S) of ASEI calls for a shift from the predominantly teacher-centred pedagogy to learner focused practices. Teachers are guided on how to actively involve learners by providing them opportunities to express opinions and explain ideas based on their prior experiences (SMASSE, 2004).The third component (E) of ASEI emphasis a shift from recipe and demonstration type experiments to investigative and hands-on type experiments (JICA, 2007). The fourth component (I) of ASEI encourages the practice of improvisation/innovativeness. This is achieved through: scaling materials for experiments, utilization of available materials in the students' immediate environment to raise the interest and curiosity, modification and simplification of recipe-type text book experiment(s) and use of non-conventional apparatus and resources (SMASSE, 2004).

When students are involved in well designed experiments, they learn how to observe, manipulate, measure, reason, and develop skills for gathering information. The current biology syllabus (KIE, 2010) has one of its main objectives as to enable learners to design and carry out experiments and projects that will help them understand biological concepts.

A study by Nyagah (1997) on pupils' performance and attitudes towards art and craft cited two dimensions of performance of a practical subject as theoretical and practical components. She argues that for the theory component, performance is judged from the results of a written examination while for the practical component, emphasis is on the process and product for a given project. For biology at secondary level in the 8-4-4 education system,

performance is demonstrated through the results of theory Kenya Certificate of Secondary Education examination at the end of four years; and the quality of practical projects done during science congress.

2.4 The Plan Do See Improve (PDSI) approach and performance in biology

To achieve the ASEI condition, the SMASSE project came up with PDSI. This means Plan, Do, See and Improve (SMASSE, 2004). This approach aims at helping teachers to effectively practice ASEI at classroom level. Important aspects of effective lesson delivery such as work planning (schemes of work and lesson plans) and evaluation are emphasized.

The first part (planning) of PDSI deals with designing of instruction (planning the lesson) and outlining lesson activities based on the ASEI principles. Arunga (2007) points out that teachers are encouraged to rethink the usefulness of lesson plans as critical tools for lesson delivery. During planning teachers take into consideration the learners' backgrounds such as learning difficulties, needs interests, misconceptions and previous experience in relation to the topic. Prominence is given to how instructional activities will enable learners to understand concepts, appreciate what they learn and apply what is learnt in real life contexts.

According to CEMASTEA (2012) the second (Do) part of PDSI is implementing the planned lesson activities and is focused on lesson delivery; the teaching and learning process. This includes lesson introduction where

teachers are guided on how to move from the traditional question and answer sessions in review of previous lessons to interactive and innovative options such as games, role play, story-telling and skits. At lesson development, Kimani (2010) observes that the lesson is designed to have sufficient, varied and interesting learner activities to motivate and engage learners and facilitate meaningful experiences. The activities provide opportunity for learner growth in knowledge through discussions, reporting, asking and answering questions; and process skills through observing, drawing, manipulating as well help the teacher deal with learners' questions, and misconceptions.

The third part (See) of PDSI calls for monitoring the learning process against the planned activities and lesson objectives. Teachers are guided to focus on lesson evaluation both as lesson progresses and at the end. Teachers can monitor learner progress through questions, explanations and ability to follow procedures. The fourth part (Improve) of PDSI means evaluating and making sense of the outcomes of the lesson in order to integrate the feedback in subsequent lessons. In PDSI cycle, Migwi (2012) notes that teachers evaluate the teaching and learning process by reflecting on performance and the effectiveness in achieving lesson objectives. The teacher makes use of feedback to modify the lesson as it progresses in order to eliminate misconceptions as well as improve subsequent instruction. (CEMASTEA, 2012).

2.5 Teachers' attitudes towards ASEI/PDSI strategies and performance in biology

Attitude is a concept, which arises from the attempt to account for the observed regularities in the behaviour of individual persons. Kind, Jones and Barmby (2007) viewed attitude as having different components which includes cognitive, affective and behavioural. Crano and Prislin (2006) however contend that the attitude one has towards an object makes one to have a judgment as to whether the object is good or bad, harmful or beneficial, pleasant or unpleasant, important or unimportant. Wambui and Nyacombe (2006) noted that teachers' attitude towards learner-centred strategies was generally neutral. They indicate that teachers are reluctant to perform experiments especially in chemistry which are deemed dangerous. They further point out that in some cases experiments failed and that most practical sessions were merely teacher demonstrations.

In a study on effects of strengthening mathematics and science on teachers' pedagogical skills, Kebaso (2012) found out that poor attitude towards learner-centred strategies is both on the part of learner and the teachers. He points out that while students think sciences are generally harder than languages and humanities; teachers might tend to think the same right from their school days or may have lost hope in their students' performance. Kebaso (2012) further notes that SMASSE targeted teachers first because of the time they spend with students and that attitude of the teacher impacts on students.

The attitude of teachers which may be characterized by teacher centeredness, inability to carry out experiments and demonstrations successfully, low frequency of experiments, chalk and talk, being content driven and knowledge based impacts negatively on students. Negative attitude among students is manifested in untidy/incomplete homework, frequent absenteeism/feigned illness, lack of attention, in class, poor performance and low enrolment in optional science subjects, especially physics (Kebaso, 2012).

Njiru (2012) concurs with Kebaso by observing that negative attitudes learner-centred strategies among students may be displayed by tendencies such as coming to class late, sleeping during the lesson, not feeling bothered by low scores, refusing to participate during the lesson and not revising science tests. Mostly, the sciences are performed poorly in KCSE not because they are difficult subjects but because learners develop negative attitude about them hence shielding away from them. A positive attitude towards science leads to a positive commitment to science that influence lifelong interests and learning in science (Simpson & Oliver, 1990)

2.6 Challenges of implementing ASEI/PDSI strategies in biology

Kipkoech (2011) investigated the challenges facing implementation of SMASSE in Kericho and observed that since its inception in 1998, the SMASSE program has contributed greatly to the improvement of performance in science and mathematics in Kenya. However, the improvement in performance has not been much as expected, despite the change in teaching

and learning approaches towards these subjects by the teachers. He attributed this dismal performance to the following factors: students' attitude is generally negative due to low entry behaviour, belief that these subjects are hard, peer pressure, lack of proper learning facilities, teachers' absenteeism and theoretical approach to teaching science and mathematics.

A related study by Ombaso (2008) explored the factors that hinder the inclusion of carefully selected activities. These were found to include: lack of sufficient time for preparation, inadequate resource, lack of support from administration and large class sizes that made it hard for teachers to give individual attention to students.

In addition, Arunga (2007) is in agreement with Mugiri (1981) that once a programme has been introduced in an education system, there is need for continual monitoring so as to unravel the challenges and come up with remedies. Mugiri (1981) discovered that teachers did not implement a challenge or innovation unless there were rewards for doing so.

From the SMASSE project impact assessment survey of 2004, Nui and Wahome (2006) reported that students were actively involved in the learning process. However, it was noted that none of the teachers had a written work plan, but judging from the flow of the lesson, it was evident that teachers knew what they intended to do. Furthermore, the findings of this study were echoed by Jangaa (2005) who says that the teachers prepare lesson plans as a matter of requirement and only do it when followed by administrators. This means

science teachers have not embraced the ASEI lesson plan format, an indication that a lot more needs to be done in encouraging teachers to use it.

2.7 Summary of literature review

The literature review was presented in six sections namely: the concept of in-service training, the ASEI practice, the PDSI approach, Effects of teachers' attitudes on performance of biology and challenges of implementing ASEI and PDSI strategies. The finding by Jangaa (2005) contradicts the SPIAS results of 2004 which claimed that teachers planned better and more consistently after attending SMASSE in-service training. Njiru (2012) reports that in 2006 Mbeere District teachers tried to actualize the ASEI lesson plan in cycles three and four but the major complaint was that it was not possible to implement it 100 percent due to the various hindrances like work load, lack of time for planning, abstract topics, resistance to change, lack of team work, inadequate physical facilities and resources.

Most of the studies reviewed so far reveal that learner-centred strategies have caused notable changes in the performance of biology. Reviewed literature indicates that the ASEI condition and positive attitude towards biology have not been fully achieved. The reviewed literature has however not revealed the root cause of poor performance of biology in secondary schools in Kinangop Sub-county despite implementation of learner-centred strategies hence the need to carry out this study.

2.8 Theoretical framework of the study

The study is based on Jean Piaget's theory of intellectual development developed in 1969. Piaget's central thesis as cited in Njiru (2012) is that the individuals are curious, active and inventive throughout their lives. In this theoretical argument science abilities are stressed which include abstract and logical reasoning, generation of hypothesis and organization of mental activities into more complex structures. Kebaso (2012) asserts that if science teachers were in-serviced, their skills improved, making students' performance consequently to improve because they acquired abilities that help to exploit and develop the potential of individual learners especially in sciences.

In constructivist approach instructors have to adapt the role of facilitators and not teachers (Kipkoech, 2011). Whereas a teacher gives a didactic lesson that covers the subject matter, a facilitator helps the learner get his/her own understanding of the content. Constructivists view learning as an active process where learners should learn to discover principles, concepts and facts for themselves. The ASEI principle advocates for activity filled learning environment, where learners' interest, understanding and retention of knowledge is enhanced. This is in line with Piaget's theory which posits that knowledge is not passively acquired but is discovered and constructed by the child's activities. Furthermore, all knowledge is tied to action and knowing an object or an event is to use it by assimilating it into an action scheme.

2.9 The conceptual framework of the study

Orodho (2009) defines a conceptual framework as a model of presentation where a researcher represents the relationship between variables in the study and shows the relationship diagrammatically.

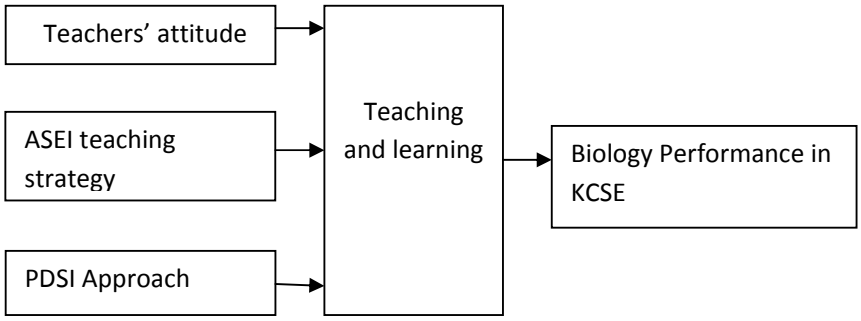

Figure 2.1: Conceptual framework: Influence of learner-centred strategies on students' biology performance.

The conceptual framework in figure 2.1 summarizes the influence of ASEI strategy, PDSI approach and teachers' attitudes on biology students' performance and how they are interrelated. If the ASEI strategy and PDSI approach are applied appropriately and teachers' attitude towards learner-centred strategy enhanced in teaching and learning of biology, the aftermath will be improved quality of teaching and learning which translates to improved biology performance in Kenya Certificate of Secondary Education Examination. This is made possible by ensuring that lessons are characterized by activities, learner-centeredness, experiments and improvisation while teachers plan, teach, observe and discuss lessons.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter focuses on research design, target population, sampling technique and sample size, research instruments, validity of the instruments, reliability of the instruments, data collection procedures and data analysis techniques.

3.2 Research design

Research design refers to the type of research guiding the study. The research adopted a descriptive survey design. Best and Kahn (2006) assert that descriptive survey involve a clearly defined problem and definite objectives, questions and development of generalizations principles and theories that have universal validity. Descriptive survey design therefore describes respondents' characteristics such as opinions, abilities, attitudes, beliefs and knowledge. Therefore this study aimed at capturing respondents' opinions and attitudes based on influence of ASEI and PDSI teaching strategies on biology performance in KCSE in Kinangop Sub-county.

3.3 Target population

Target population is defined as that population to which the researcher wants to generalize the results of a study (Mugenda & Mugenda, 2003). According to the data from District Education Officer (2013), there are 15 public secondary schools, 32 biology teachers and 1152 biology candidates in Kinangop Sub-county. In descriptive studies, two categories of respondents are crucial, that is, the informed specialist and consumers of a particular intervention. Consequently,

this study targeted subject teachers who represented informed specialist and students who are direct consumers.

3.4 Sampling techniques and sample size

Mugenda and Mugenda (2003) define a sample as a small group from the accessible population. According to Mugenda and Mugenda (2003) an appropriate sample size should be ten percent of the population. They further recommend as large sample as possible. However, for this study 20 percent of the students were used. In this case 10 out of 15 schools in Kinangop Sub-county were sampled purposively because they were established before SMASSE inception in the Sub-county and hence would provide data on performance before introduction of SMASSE. Form four students were selected for ease of interpretation of questionnaires and also because they are the ones to sit for KCSE examination.

Table 3.1: Population and sample sizes

Category	population	sample
School	15	10
Biology teachers	32	20
Biology students	1154	230

3.5 Research instruments

The only research instrument used in this study was a questionnaire for biology teachers and biology students. A questionnaire is suitable for collecting this data because according to Sekaran (2006) it is less expensive when administered to a group of respondents, establishes rapport and motivates the respondents.

Anonymity in questionnaires helps to produce more frank responses than interviews since there is no fear of victimization (Sekaran, 2006). In this study only two categories of questionnaires were used, that is, biology teachers' questionnaire and students' questionnaire.

Biology teacher's questionnaire had five parts. Part A which had seven items on demographic data of teachers, part B on extent of ASEI practice and had nine items, part C had six items and was on the PDSI approach, part D had nine items and was on the attitude of the teacher's while part E had ten items and was on challenges of implementing ASEI/PDSI. The biology students' questionnaire had five parts. Part A was on demographic data of students, part B on ASEI practice, part C was on the PDSI approach, part D was on attitude of the students while part E was on challenges of implementing ASEI/PDSI strategies.

3.5.1 Validity of instruments

Kothari (2003) defines validity as the degree to which an instrument measures what it is supposed to measure. To enhance content validity, appropriate and adequate items relevant to research objectives were included in the questionnaires. To improve on validity, a pilot study was carried out in two schools using four teachers and 20 students to identify items that were inadequate in measuring the variables hence discarding or improving on them. The two schools did not form part of the schools selected for the study. The instruments were then reviewed with the help of the project supervisors who are experts in this area of study.

3.5.2 Reliability of instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda & Mugenda, 2003). Test-retest technique was used to ascertain the reliability of the instrument. Four teachers and twenty student respondents were randomly selected to respond to the items. After two weeks, the same items were administered to same respondents and the results compared to determine the reliability of the instrument (Orodho, 2009). Pearson's product moment correlation formula was employed to compute the correlation co-efficient.

$$r = \frac{\sum xy - \frac{\sum x \sum y}{N}}{\sqrt{\left[(\sum x^2) - \frac{(\sum x)^2}{N}\right]\left[(\sum y^2 - \frac{(\sum y)^2}{N}\right]}}$$

Where

r- The degree of reliability

x- The score obtained during the first test

y- The score obtained during the second test

$\sum$- means summation

N- The number of scores within each distribution

Source: Orodho (2009)

The range of coefficient is normally -1 to +1. A correlation coefficient of 0.88 for the teacher and 0.92 for the student indicated a high degree of reliability of the

data. According to Frankel and Wallen (2000) if the correlation lies between 0.5 and 1.0 the instrument will be judged reliable.

3.6 Data collection procedures

A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). The District Commissioner and the District Education Officer Kinangop Sub-county were presented with a copy of the permit and an introductory letter before the commencement of the study. The principals of the sampled schools were served with an introductory letter at least a day before the data was collected. The researcher did personally visit the schools and administered the questionnaires. Teachers and students were given at least two days to complete the questionnaires after which they were collected by the researcher.

3.7 Data analysis techniques

Data analysis techniques are statistical methods which were used to analyze data so that it could be interpreted. The questionnaires were checked for completeness while data was coded by assigning a code to every response. In coding, the factor items were scored from a five point Likert scale. Descriptive statistics were used to summarize the data in form of means, standard deviations, frequencies and percentages and the data was organized and presented in form of frequency tables, bar graphs and pie-charts. Statistical package for social sciences (SPSS) was used to tabulate code and process data into a database because it is able to handle large amounts of data. Qualitative data was grouped into similar themes and words were used to explain the situation. All data analysis was done in line with the research objectives of the study and research questions.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents findings from the study with data generated from the field. The findings have been presented with respect to each of the specific research questions. The methods used in data analysis are both qualitative and quantitative. The main issues discussed include the following: the respondents' response rate, background information of the respondents and responses to the research questions.

4.2 The respondents' response rate

The study involved a sample of ten secondary schools drawn from a target population of fifteen public secondary schools. This information is shown in the table 4.1.

Table 4.1 Questionnaire return rate

Respondents	Target	Response	Response rate
Biology teachers	20	20	100.0
Biology students	230	226	98.3
Total	**250**	**246**	**98.4**

The researcher had targeted 20 biology teachers for the study all of whom participated forming a 100 percent return rate. The study also targeted 230 biology students of whom 226 responded to the study questions making a response rate of 98.3 percent. This was a very good degree of response (Mugenda, 2003). According to Edwards, Robert, Clarke Diguiseppi, Pratop, Wentz and Kwan

(2000), a questionnaire return rate of 80 percent and above is absolutely satisfactory, while 60 percent to 80 percent return rate is barely acceptable. The high rate of questionnaire return is an indication that the teachers and students responded properly and hence were interested in the study. The questionnaire return rate was high because the researcher collected the questionnaires immediately they were filled.

4.3 Background information of the respondents

The target respondents in the study were biology teachers and students from Kinangop sub-county. In order to gain understanding of the respondents involved in the study, each respondents were asked to indicate their personal data.

Information that was included in the teachers' demographic data were gender, highest professional qualification, age, length of teaching, lessons in a week, SMASSE INSET attendance and years taught in the current station.

4.3.1 Distribution of teachers by gender

The biology teachers were asked to indicate their gender. This information was useful in showing gender distribution in the schools under study. This will indicate whether there is gender balance or imbalance in the schools under study. Gender imbalance may influence the students' attitude towards learner-centred strategies. The distribution of teachers by gender is illustrated by table 4.2.

Table 4.2 Distribution of teachers by gender

Gender	Frequency	Percentage
Male	16	80.0
Female	4	20.0
Total	**20**	**100.0**

The study established that majority of the biology teachers were male. From the findings in table 4.2, 80 percent of the biology teachers were male while 20 percent of the biology teachers were female; this shows that the teaching in biology in the sub-county was dominated by males. This implies that majority of the biology teachers involved in the study were males. This may be attributed to apathy and stereotypes that showed science subjects as a male domain. Female teachers may impact on the attitude of the girl child as they would like to emulate their female biology teachers. A study by Changeiywo, Ngeno and Barchok (2002) on teachers' intention to apply SMASSE methods in secondary schools by gender in Kericho found that there was no statistically significance difference in how teachers apply the ASEI/PDSI teaching strategy by gender. This means that the skewed numbers of male to female teachers will not affect the findings of this study.

4.3.2 Distribution of teachers by highest professional qualifications

Biology teachers were also required to indicate their highest professional qualification. The factor of highest professional qualification is important in determining the level of competence which is necessary in the implementation of

the learner-centred strategies. The figure 4.1 illustrates distribution of teachers by highest professional qualifications.

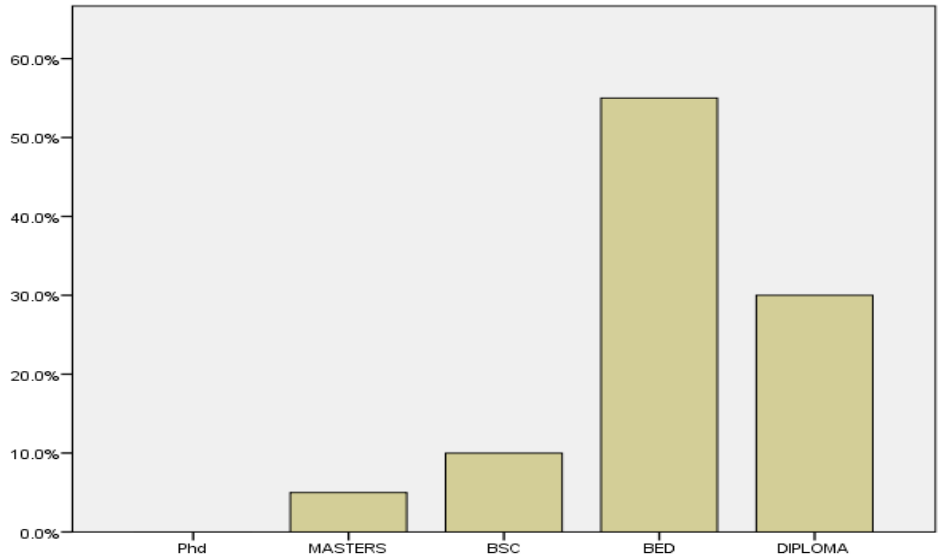

Figure 4.1 Distribution of teachers by highest professional qualification

The study revealed that most of the biology teachers in the sub-county had attained a Bachelors' degree in education. The findings show that biology in the region is being handled by professional teachers who were qualified to teach biology. This is in line with the Teachers Service Commission guidelines for hiring teachers, that is, it is a policy requirement to have a minimum of a Diploma to teach in secondary school. There is need however for diploma teachers to upgrade themselves through joining higher level institutions like universities for degree courses to gain modern skills and improve their effectiveness.

4.3.3 Distribution of teachers by age

When respondents were categorised according to age, the results were as illustrated on the figure 4.2.

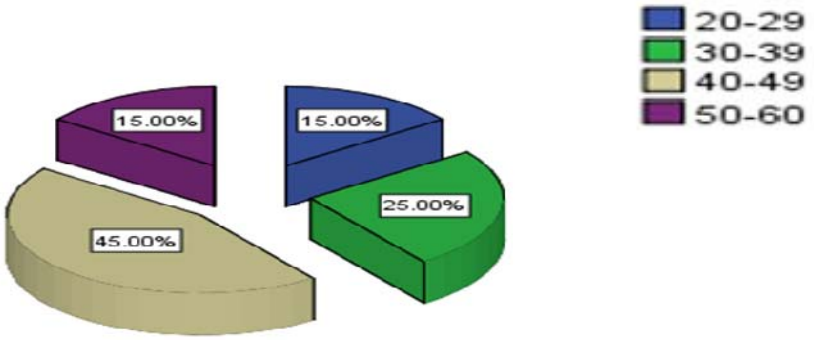

Figure 4.2 Distribution of teachers by age

From the findings, the study revealed that 45 percent of the biology teachers were aged between 40 years and 49 years. This implies that the teachers involved in the study were mature and were expected to have good mastery of content due to long exposure to the content hence were in a better position to apply learner centred strategies than those who are still young in the profession. The study findings also revealed that biology teachers were well distributed in terms of their age noting that there were young biology teachers in the region, this shows that biology teaching was being done by both the young and the old.

4.3.4 Distribution of teachers by teaching experience

The researcher sought to know the teaching experience of teachers under study. The results are shown in table 4.3.

Table 4.3 Distribution of teachers by teaching experience in years

Teaching experience	Frequency	Percent
1 – 5	4	20.0
6 – 10	2	10.0
11 – 15	5	25.0
Above 15	9	45.0
Total	**20**	**100.0**

As shown in table 4.3, 20 percent of the teachers responded that they have taught for less than 5 years whereas 45 percent of them indicated that they had over 15 years teaching experience. This implies that most of the teachers had adequate experience to make them efficient and effective in their profession (Ndirangu, 2006). They could also give factors that lead to poor performance in biology since they have taught for a long time. This implies that majority of the respondents had worked long enough and therefore were conversant with the impact of the leaner centred teaching strategies on students' performance in biology. This is in agreement with the study by Moini (2009) who established that work experience of teachers influences their attitude towards their teaching subject and more experienced teachers tend to perform better than novice teachers.

4.3.5 Distribution of teachers by workload

The study sought to find out the weekly teaching load of the biology teachers. The findings are represented in table 4.4.

Table 4.4 Distribution of teachers by workload

Workload(lessons) per week	Frequency	Percentage
4 -10	0	0.0
11-18	2	10.0
19- 24	10	50.0
Above 24	8	40.0
Total	**20**	**100.0**

The study revealed that 10 percent of the teachers had a workload of 11 – 18 lessons whereas 40 percent had a workload of above 24 lessons. This implies that most teachers have inadequate time to prepare ASEI lesson plans as well as marking students work. For teachers to practice learner-centred strategies effectively they require a lesser workload so that they can have ample time for proper planning.

4.3.6 Distribution of teachers by attendance of SMASSE INSET

To establish the number of teachers who attended SMASSE INSET, the researcher asked the teachers to indicate whether or not they attended the SMASSE INSET. The study revealed that all the teachers interviewed (100 percent) indicated that they had attended SMASSE INSET. This implies that teachers are willing to learn new teaching strategies and embrace changes. This

further demonstrates a positive change in attitude by the biology teachers which is very essential in the implementation of learner centred strategies.

4.3.7 Distribution of teachers by SMASSE INSET cycles attended

To establish how frequent the teachers attended SMASSE INSET, the researcher asked the respondents to indicate the number of SMASSE INSET cycles attended. The findings are presented in table 4.5.

Table 4.5 Distribution of teachers by SMASSE INSET cycles attended.

SMASSE Cycles	Frequency	Percentage
1 cycle	1	5.0
2 cycles	2	10.0
3 cycles	3	15.0
4 cycles	14	70.0
Total	**20**	**100.0**

As shown in table 4.5, 70 percent of the teachers indicated that they had completed four cycles since the SMASSE INSETS began while five percent indicated one cycle. Some teachers did not attend all cycles and therefore they have gaps in knowledge because each cycle had a specific theme. Completion of 4 cycles is expected to equip teachers with good mastery of subject and positive attitude towards learner centred strategies which could improve their teaching skills. This concurs with a previous study by Inyega (2002) which revealed that attendance of all the SMASSE cycles promoted positive attitudes towards the subjects among teachers and improve their effectiveness in teaching.

4.3.8 Distribution of teachers by period taught in current stations

To establish staff stability, teachers were asked to indicate the period taught in their current stations. The findings are presented in table 4.6.

Table 4.6 Distribution of teachers by period taught in current station

Period (years)	Frequency	Percentage
Less than 1	3	15.0
1 – 5	8	40.0
6 – 10	3	15.0
11 – 15	2	10.0
Above 15	4	20.0
Total	**20**	**100.0**

The study revealed that 40 percent of the teachers have taught for one to five years in their current station while 20 percent have taught for more than fifteen years. This implies that there is low staff stability leading to relatively high teacher turnover. For an innovation such as SMASSE to yield good results there is need to ensure staff stability.

4.3.9 Demographic information of students

Included in the biology students' demographic data was their class, gender, type their school boarding status, their own boarding status, their KCPE marks and their current performance in biology.

4.3.10 Distribution of students by gender.

The biology students were asked to indicate their gender. The findings are presented in table 4.7.

Table 4.7 Distribution of students by gender

Gender	Frequency	Percentage
Male	111	49.1
Female	115	50.9
Total	**226**	**100.0**

The table 4.7 above indicates that 50.9 percent of the biology students are female and 49.1 percent are male. This implies that more female students study biology as compared to male student. This may be attributed to apathy and stereotypes that showed science subjects as male domain. Since biology is an optional subject, most girls prefer taking biology rather than physics while boys prefer the converse. This so happens in schools where chemistry is compulsory and students has to choose their second subject between biology and physics.

4.3.11 Distribution of schools by type

To have an understanding of the types of schools under study students were asked to indicate the type of school they belong to. The findings were summarised in table 4.8.

Table 4.8 Distribution of schools by type

School type	Frequency	Percentage
Boys	42	18.6
Girls	45	19.9
Mixed	138	61.1
Total	**230**	**100.0**

The table 4.8 above shows that 18.6 percent of the schools in the Kinangop sub-county admit male students only, 19.9 percent admit female students while 61.1 percent admit students of both genders. This means that the sample is a good representation. The schools that admit students of one gender have the advantage of interpersonal competition which will eventually yield good results. Group discussions constituted by students of same gender are more likely to be successful than those composed of both genders as shyness is not common.

4.3.12 Distribution of schools by boarding status

The boarding status of the schools was considered in this study as it determines the amount of time available for practising ASEI/PDSI strategies. Boarding schools have extra time for remedial teaching, group discussions as well as project work as compared to day schools. The extra work is expected to translate to improve performance in biology. To have an understanding of the types of schools in the area under study, the schools were grouped into three categories as shown in figure 4.3.

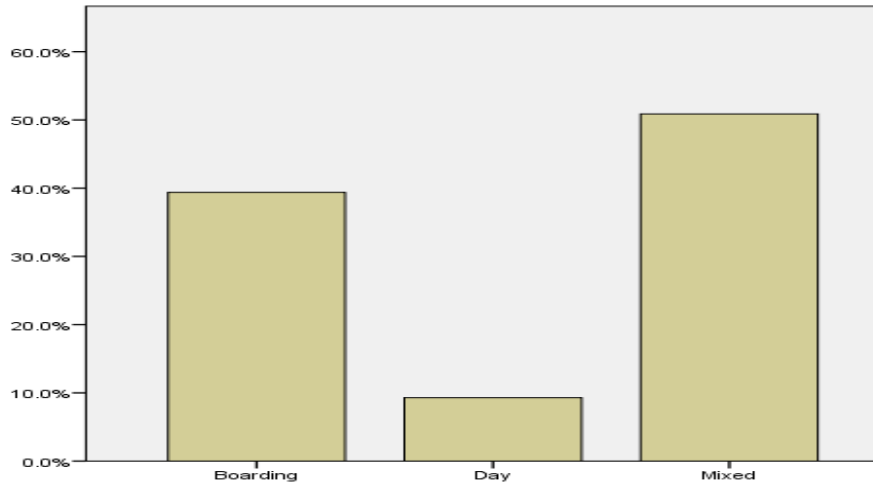

Figure 4.3 Distribution of schools by boarding status

The information shown in Figure 4.3 above indicates that 39.4 percent of the schools in Kinangop sub-county are boarding schools, 9.3 percent are mixed day schools while 50.9 percent are mixed day and boarding. This means that mixed schools were predominant in the study. Students in boarding schools usually have a lot of free time and therefore have adequate time to practice the learner-centred strategies especially ASEI strategy.

4.3.13 Distribution of students by KCPE marks

In order to establish the entry behaviour of the students in the area under study, students were asked to indicate their KCPE examination marks. The results were as shown in table 4.9.

Table 4.9 Distribution of students by KCPE examination marks

Marks	Frequency	Percentage
351 – 500	26	11.5
320 – 350	49	21.7
290 – 319	55	24.3
250 – 289	72	31.9
Below 250	24	10.6
Total	**226**	**100.0**

The information shown in table 4.9 above indicates that 11.5 percent of the students scored 351 marks and above in KCPE examination while only 10.6 percent scored below 250 marks. This implies that most of the students were above average in KCPE examination performance hence high entry behaviour. High entry behaviour would translate to faster comprehension of new ideas and better participation in learner-centred strategies. Kipkoech (2011) found out that students' attitude to teaching and learning biology was generally negative due to low entry behaviour.

4.3.14 Distribution of students by current performance in biology

To establish the current performance in biology of students in the study area, students were asked to indicate their current biology mean scores .The findings were represented in figure 4.4.

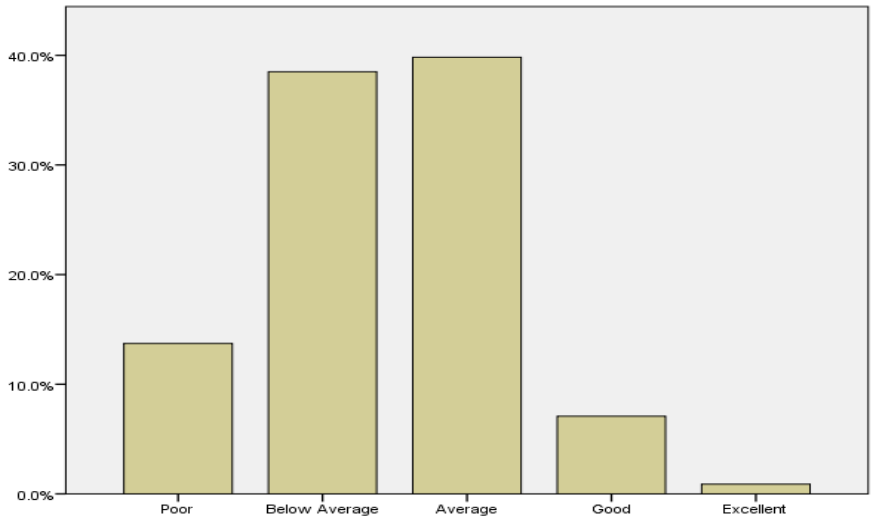

Figure 4.4 Distribution of students by Current performance in biology

Figure 4.4 above indicates that 52.2 percent of the students currently score below average while 47.8 percent score above 50 percent. This implies that knowledge, skills and concepts learnt during SMASSE INSET have not yielded the expected results. The results contradicts the findings by Migwi (2012) which indicated that schools performed better in biology after teachers attended SMASSE INSET programme.

4.4 Findings on the extent of ASEI practice

To address the question of the extent to which the ASEI strategy influence students' performance in KCSE in biology in Kinangop sub-county data was sought to provide information on the activities performed by the teachers in teaching biology. The questionnaire also sought information from the students to determine the activities they are involved in.

4.4.1 Teachers' responses on extent of ASEI practice in biology

The researcher sought to find out the extent to which teachers had applied the ASEI strategy in the teaching and learning of biology. This data is presented in table 4.10.

Table 4.10 Teachers' responses on extent of ASEI practice on biology

	Item	Daily		Weekly		Monthly		Termly		Never		Totals	
		F	%	F	%	F	%	F	%	F	%	F	%
i)	Engage students in a variety of activities	7	35	9	45	2	10	1	5	1	5	20	100
ii)	Give class demonstration	2	10	9	45	6	30	1	5	2	10	20	100
iii)	Organize group discussion	1	5	9	45	7	35	3	15	0	0	20	100
iv)	Carry out small scale experiments	1	5	9	45	7	35	3	15	0	0	0	100
v)	Engage students in project work	0	0	0	0	1	5	6	30	13	65	20	100
vi)	Improvise in experiments	2	10	4	20	7	35	6	30	1	5	20	100
vii)	Use teaching aids such as models and charts	6	30	10	50	2	10	1	5	1	5	20	100
viii)	Organize field trips/ecological studies	0	0	0	0	0	0	0	0	20	100	20	100
ix)	Involve students in designing experiments	0	0	3	15	2	10	11	55	4	20	20	100

Table 4.10 above shows that 35 percent of the biology teachers in the sub-county engage students in a variety of activities daily. This is in agreement with the

findings by Ndirangu (2006) that involvement of learners during the lesson is yet to be achieved. The study showed that ten percent of the teachers gave class demonstrations daily. The study revealed that only percent of the teachers organize group discussions on daily basis. The study also showed that only five percent of the teachers carried out small scale experiments daily. The National Research Council (1996) believes that the best way of teaching biology is to assist learners by arousing their curiosity.

On engaging students in project work the study revealed that 65 percent of the teachers do not engage students in project work at all. On improvisation ten percent of the teachers indicated that they improvise in experiments daily. This implies that the improvisation of resources has not been fully achieved in the teaching of biology. This contradicts the findings by Ndirangu (2006) that 59 percent of the teachers improvised during experiments.

On use of teaching aids such as models and charts only 30 percent indicated that they use them almost every lesson. Pertaining to organization of field trips all of the teachers indicated that they never organized field trips. This study indicated that 55 percent of the teachers involve students in designing of experiments once in a term. The information indicates that the ASEI strategy has not been fully implemented in the teaching of biology in Kinangop sub-county.

4.4.2 Students' responses on the extent of ASEI practice in biology

The researcher sought information from the student on the teaching practices in biology in order to confirm the teaching practices of their teachers. This information is presented in frequencies and percentages in table 4.11.

Table 4.11 Students' responses on the extent of ASEI practice in biology

	Item	Daily		Weekly		Monthly		Termly		Never		Total	
		F	%	F	%	F	%	F	%	F	%	F	%
i)	Individual experiment	3	1.3	7	3.1	9	4	91	40	116	51	226	100
ii)	Group discussions	22	9.7	119	52.7	41	18.1	27	11	17	7	226	100
iii)	Observe teacher demonstration	5	2.2	28	12.4	25	11.1	61	27	1.7	47.3	226	100
iv)	Go for field trips	0	0	0	0	1	.4	6	2.7	219	96.9	226	100
v)	Carry out ecological studies	0	0	24	10.6	23	10.2	69	30.5	110	48.7	226	100
vi)	Do project work	0	0	4	1.8	7	3.1	22	9.7	193	85.4	226	100
vii)	Do peer teaching	44	19.5	52	23	29	12.8	36	15.9	65	28.8	226	100

The table 4.11 above shows that only one percent of the students indicated that individual experiments are carried out daily while 51 percent indicated never. This indicate that most students are not given adequate time to manipulate apparatus as advocated for by the SMASSE INSET. The study shows that only 9.7 percent of the students were involved in group discussions. The study indicated that 47.3 percent of the students never observed teacher demonstration. This implies that teacher demonstration was teacher-centred rather than learner-centred. The study indicated that 96.9 percent of the biology students were not involved in field trips. On carrying out ecological studies 48.7 percent of the students indicated they

never carried out ecological studies. This implies that biology teachers need to take students for ecological studies more often to expose them to real life situations. The study revealed that 85.4 percent of the students were not involved in project work. Some students (19.5 percent) also indicated that there was peer teaching during the lessons. This means that teachers have to re-emphasize the importance of project work as well as peer teaching.

4.4.3 Biology performance based on the ASEI practice

The level of implementation of ASEI strategy was rated and compared with KCSE biology performance in ten schools in the last five years as in table 4.12.

Table 4.12 Biology performance based on the ASEI Practice

Schools	Rating	2009	2010	2011	2012	2013
A	35	65.6	74.8	74.4	71.5	64.0
B	30	52.3	57.6	59.8	55.6	56.3
C	31	53.6	54.0	55.5	62.8	52.0
D	22	30.3	39.2	33.0	45.2	50.0
E	20	26.8	30.2	36.2	32.5	32.7
F	25	25.3	27.4	35.8	37.0	44.6
G	27	32.8	31.2	31.1	34.9	36.0
H	26	29.6	23.6	30.6	31.6	30.8
I	21	33.8	25.8	33.3	24.2	26.6
J	24	37.2	27.8	44.1	38.2	46.3

The researcher used the likert type scale which is a summation rating. The total scores were computed by summing the value of the nine items checked for each

respondent. Table 4.12 indicates that 30 percent of the schools have exceeded the average rating of 27 but have not attained the maximum rating of 45.This means that the schools have implemented the ASEI strategy but not fully as expected. The findings also indicate that the higher the rating the higher the KCSE results meaning that the ASEI practice influence the performance.

4.5 Findings on the PDSI approach

4.5.1 Teachers' response on the extent of PDSI practice in biology

The researcher sought information from the teachers on the teaching practices in biology to confirm the implementation of PDSI strategy. This information is presented in table 4.13.

Table 4.13 Teachers' responses on the extent of PDSI practice in biology

		Daily		Weekly		Monthly		Termly		Never		Totals	
		F	%	F	%	F	%	F	%	F	%	F	%
i)	Prepare an ASEI lesson plan	1	5.0	5	25	1	5.0	2	10	11	55	20	100
ii)	Considers learners' background before planning	12	60	3	15	1	5	0	0	4	20	20	100
iii)	Use students' suggestions for teaching	10	50	5	25	2	10	2	10	1	5	20	100
iv)	Allow students to report their findings	3	15	9	45	5	25	2	10	1	5	20	100
v)	Allow students to evaluate your lesson	5	25	3	15	1	5	4	20	7	35	20	100
vi)	Use students' feedback to improve your lesson	8	40	4	20	2	10	3	15	3	15	20	100

The table 4.13 above shows that only five percent of the biology teachers in the study prepare ASEI lesson plans in every lesson as advocated for by the SMASSE innovation while 55 percent do not prepare ASEI lesson plans at all. The study showed that 60 percent of the teachers consider learners' background before planning their lessons while 20 percent do not consider learners' background during planning. The study revealed that 50 percent of the teachers use students' suggestions. This indicates that majority of the teachers have embraced the aspect of learner's involvement in the learning process. On allowing students to report their findings the study showed that only 15 percent of the teachers allowed them to report their findings daily.

On allowing students to evaluate the lesson, the study showed that 25 percent of the teachers allow them daily while 35 percent do not allow them at all. This indicates that the use of students to evaluate lessons is not fully achieved in the teaching of biology. The study further revealed that only 40 percent of the teachers use students' feedback to improve their lesson daily. The information indicates that the PDSI approach has not been implemented fully.

4.5.2 Students' responses on the extent of PDSI practice in biology.

The researcher sought information from the students on the teaching practices in biology to confirm the teaching practices of their teachers. This information is presented in table 4.14.

Table 4.14 Students'responses on the extent of PDSI practice in biology

	Item	Daily		Weekly		Monthly		Termly		Never		Total	
		F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
i)	Participate in lesson preparation	14	6.2	30	13.3	26	11.5	74	31.9	84	37.2	226	100
ii)	Give suggestions during the lesson	85	37.6	49	21.7	36	15.9	31	13.7	24	11.1	225	100
iii)	Report your findings	29	12.8	74	32.7	32	14.2	40	17.7	51	22.6	226	100
iv)	Comment on the lesson delivery	51	22.6	47	20.8	28	12.4	38	16.8	62	27.4	226	100
v)	Ask questions on unclear concepts	108	47.8	56	24.8	24	10.6	21	9.3	17	7.5	226	100
vi)	Share your experience with others	101	44.7	53	23.5	14	6.2	34	15	24	10.6	226	100

The table 4.14 above shows that only 6.2 percent of the students participate in lesson preparation daily while 37.2 percent of them never participated. This means that most of the students participate in lesson preparation sometimes. Only 37.6 percent of the students indicated that they give suggestions during the lesson daily. The study shows that only 12.8 percent of the students report their findings

daily while 22.6 percent do not report their findings. On whether they comment on the lesson delivery 22.6 percent of the students indicated that they do, while 27.4 percent indicated never. Commenting on lesson delivery is very vital as it helps the teacher to improve on lesson delivery. At least 47.8 percent of the students indicated that they ask questions on unclear concepts daily. The study further revealed that 44.7 percent of the students share their experience with others daily while 10.6 percent of the students indicated never.

4.5.3 Biology performance based on PDSI approach

The level of implementation of PDSI approach was rated and compared with KCSE biology performance in schools in the last five years as in table 4.15.

Table 4.15 Biology performance based on PDSI approach

School code	Rating	2009	2010	2011	2012	2013
A	23	65.6	74.8	74.4	71.5	64.0
B	19	52.3	57.6	59.8	55.6	56.3
C	29	53.6	54.0	55.5	62.8	52.0
D	30	30.3	39.2	33.0	45.2	50.0
E	16	26.8	30.2	36.2	32.5	32.7
F	19	25.3	27.4	35.8	37.0	44.6
G	18	32.8	31.2	31.1	34.9	36.0
H	23	29.6	23.6	30.6	31.6	30.8
I	14	33.8	25.8	33.3	24.2	26.6
J	18	37.2	27.8	44.1	38.2	46.3

The researcher used the likert scale which is a summation rating. The total scores were computed by summing the value of the six items checked for each respondent. Table 4.15 indicates that 50 percent of the schools have exceeded the rating of 18 but have not attained the maximum rating of 30.This implies that the PDSI strategies have not been fully implemented.

4.6 Findings on the attitude of teachers ASEI and PDSI strategies

4.6.1 Teachers' responses on attitude towards ASEI/PDSI strategies

The researcher sought for information from teachers on their attitude towards implementation of ASEI and PDSI strategies in biology. The data is presented in table 4.16.

Table 4.16 Teachers' responses on attitude towards ASEI/PDSI strategies

	Item	Strongly agree		Agree		Not sure		Disagree		Strongly disagree		Totals	
		F	%	F	%	F	%	F	%	F	%	F	%
i)	An ASEI lesson plan is difficult to prepare	3	15	7	35	1	5	7	35	2	10	20	100
ii)	A lot of time is required to prepare comprehensive lesson notes	7	35	11	55	0	0	2	10	0	0	20	100
iii)	My students rarely give correct answers	0	0	2	10	2	10	10	50	6	30	20	100
iv)	My school has inadequate facilities for one to do practical	0	0	2	10	0	0	8	40	10	50	20	100
v)	It is not possible to have an activity in every lesson	3	15	9	45	0	0	7	35	1	5	20	100
vi)	My students do not perform due to low entry behaviour	0	0	7	35	0	0	8	40	5	25	20	100
vii)	Evaluation is very necessary for effective teaching and learning	13	65	6	30	0	0	0	0	1	5	20	100
viii)	Having a variety of activities during the lesson delays syllabus coverage	5	25	10	50	0	0	4	20	1	5	20	100
ix)	Immediate follow-up assignments enhance academic performance	11	55	9	45	0	0	0	0	0	0	20	100

The data represented in table 4.16 showed that 15 percent of the teachers indicated that ASEI lesson plan is difficult to prepare while 45 percent of them disagreed. The study also showed that the teachers appreciated the value of planning their work though 35 percent strongly felt that a lot of time was required to prepare comprehensive lesson notes. On whether students rarely give correct answers 30 percent of the teachers disagreed while 10 percent agreed. Most teachers (50 percent) indicated that their schools had adequate facilities for one to do practical, only 15 percent of the teachers strongly agreed that it is not possible to have an activity in every lesson. Students do not passively receive and process information. They are active participants in the learning process (DECD, 2004). Students should therefore be encouraged to participate more during the lessons through activities.

The study further revealed that 35 percent of the teachers agreed that their students do not perform due to low entry behaviour while 25 percent indicated that entry behaviour does not affect performance. More so, the study shows that, 65 percent of the teachers strongly agree that evaluation is very necessary for effective teaching and learning. However, the majority (75 percent) of the teachers felt that having a variety of activities during the lesson delays syllabus. All the teachers (100 percent) indicated that immediate follow up assignments enhance academic performance. This data indicates that the attitude of the teachers towards learner centred strategies in the teaching of biology is positive but is still attaining.

4.6.2 Students' responses on attitude towards ASEI/PDSI strategies

The researcher sought information from students on their attitude towards learner-centred strategies as applied in biology. The results were summarized in frequencies and percentages in table 4.17.

Table 4.17 Students' responses on attitude towards ASEI/PDSI strategies.

		Strongly agree		Agree		Not sure		Disagree		Strongly disagree		Totals	
		F	%	F	%	F	%	F	%	F	%	F	%
i)	Working with living organisms in biology is very interesting	150	66.4	65	28.8	8	3.5	0	0	3	1.3	226	100
ii)	Discussion helps me share ideas with other students	163	72.1	55	24.3	5	2.2	1	.4	2	.9	226	100
iii)	I understand biology concepts better during peer teaching	85	37.6	90	39.8	20	8.8	23	10.2	8	3.5	226	100
iv)	Field trips enable me to appreciate biology as part of real world	156	69	50	22.1	15	6.6	2	.9	3	1.3	226	100
v)	When involved in an experiment i develop scientific skills	143	63.3	73	32.3	7	3.1	2	.9	1	.4	226	100
vi)	Project work enables me to engage in scientific investigation of my choice	115	50.9	78	34.5	25	11.1	6	2.7	2	.9	226	100
vii)	I gain a lot by participating in a teacher demonstration	152	67.3	58	25.7	6	2.7	4	1.8	6	2.7	226	100

The table 4.17 above shows that most of the teachers (66.4 percent) agreed that working with living organisms in biology is very interesting. A smaller number (1.3 percent) however disagreed. The study shows that (72.1 percent) of the respondents agreed that discussion help them share ideas with other students, 2.2 percent were not sure while 0.9 percent strongly disagreed. Some 37.6 percent of the students strongly agreed that they understood biology concepts better during peer teaching while 13.7 percent of the students disagreed.

The study indicated that 69 percent of the students strongly agreed that field trips enable them appreciate biology as part of real world. However, 1.3 percent of the students disagreed. Majority of the students' (63.3 percent) strongly agreed that when involved an experiment they develop scientific skills. When students are involved in well designed experiments, they learn how to observe, manipulate, measure, reason and develop skills for gathering information (JICA, 2007). On project work enabling one to engage students in scientific investigation 50.9 percent of the students strongly agreed while 0.9 percent disagreed. Majority of the respondents (67.3 percent) strongly agreed that they gain a lot by participating in a teacher demonstration; however, 2.7 percent of them strongly disagreed.

4.6.3 Biology performance based on teachers' attitudes towards learner-centred strategies

Teachers' attitudes towards learner-centred strategies were rated and compared with KCSE biology performance in ten schools in the last five years as in table 4.18.

Table 4.18 Biology performance based on teachers' attitudes

Schools	Rating	2009	2010	2011	2012	2013
A	30	65.6	74.8	74.4	71.5	64.0
B	37	52.3	57.6	59.8	55.6	56.3
C	34	53.6	54.0	55.5	62.8	52.0
D	29	30.3	39.2	33.0	45.2	50.0
E	29	26.8	30.2	36.2	32.5	32.7
F	32	25.3	27.4	35.8	37.0	44.6
G	35	32.8	31.2	31.1	34.9	36.0
H	38	29.6	23.6	30.6	31.6	30.8
I	25	33.8	25.8	33.3	24.2	26.6
J	36	37.2	27.8	44.1	38.2	46.3

The researcher used the Likert type scales which are summated ratings. The positive items were assigned higher weights and negative items lower weights. The total score was computed by summing up the value of items checked for each respondent. Table 4.18 indicates that the attitude of teachers towards learner-centred strategies is positive. The data showed that 90 percent of the teachers scored 28-45 the positive attitude category.

4.7 Findings on challenges of ASEI/PDSI strategies

4.7.1 Teachers' responses on Challenges of ASEI/PDSI strategies.

To establish the challenges that face the implementation of ASEI and PDSI strategies, teachers were asked to indicate their level of agreement with the items listed. The results are in the table 4.18.

Table 4.18 Teachers' responses on challenges of ASEI/PDSI strategies.

		Strongly agree		Agree		Undecided		Disagree		Strongly disagree		Totals	
		F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
i)	Lack of sufficient time	8	40	12	60	0	0	0	0	0	0	20	100
ii)	Large class size	9	45	8	40	0	0	3	15	0	0	20	100
iii)	Heavy teaching load	10	50	8	40	0	0	2	10	0	0	20	100
iv)	Low morale among teachers	3	15	12	60	1	5	4	20	0	0	20	100
v)	Syllabus too long	1	5	7	35	0	0	12	60	0	0	20	100
vi)	Pressure to cover syllabus	4	20	12	60	0	0	3	15	1	5	20	100
vii)	Low entry behaviour	0	0	13	65	0	0	5	25	2	10	20	100
viii)	Lack of laboratory assistant	3	15	1	5	0	0	10	50	6	30	20	100
ix)	Lack of supervision	2	10	2	10	0	0	10	50	6	30	20	100
x)	Mischievous students	2	10	2	10	2	10	9	45	5	25	20	100

The table 4.18 above shows that 40 percent of the teachers strongly agreed that they had no sufficient time for implementing learner centred strategies. Some 45 percent of the respondents strongly agreed that large class size was a challenge to effective implementation of ASEI/PDSI; however, 15 percent of the teachers indicated that large class size was not a challenge.

The study revealed that 50 percent of the teachers strongly agreed that heavy teaching load was an impediment in the implementation of learner centred strategies while 10 percent of the teachers disagreed with the same. Low morale among teachers was an obstacle to proper implementation of ASEI/PDSI as indicated by 60 percent of the teachers, though 20 percent of them disagreed. Only five percent of the teachers strongly agreed that syllabus was too long while 60 percent disagreed.

On pressure to cover the syllabus 60 percent of the teachers agreed while five percent strongly disagreed. The study further indicated that 65 percent of the teachers agreed that low entry behaviour slowed down implementation of ASEI/PDSI strategies while ten percent strongly disagreed. Lack of laboratory assistant is not a major challenge in implementation of learner centred strategies. This was confirmed by 30 percent and 50 percent of the respondents who strongly disagreed and disagreed respectively. Lack of supervision was not a challenge as confirmed by 30 percent and 50 percent of the teachers who indicated strongly disagree and agree respectively. Only ten percent of the respondents strongly agreed that mischievous students were a challenge to proper implementation of learner-centred strategies.

4.7.2 Students' responses on challenges of ASEI/PDSI strategies

To establish the challenges of ASEI/PDSI strategies, the students were asked to indicate the challenges they face in the learning of biology. The results are indicated in the figure 4.5.

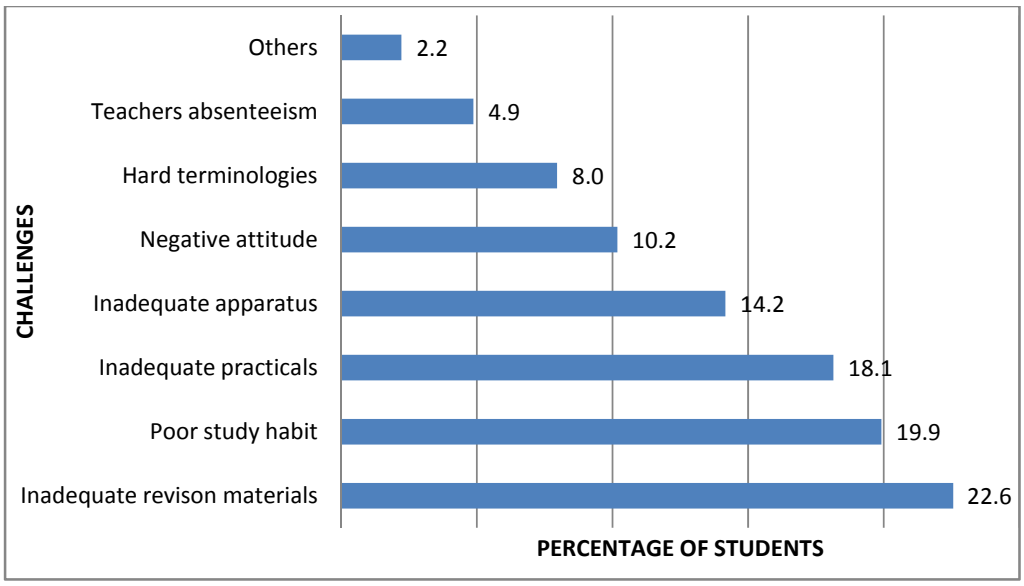

Figure 4.5 Students' responses on challenges of ASEI/PDSI strategies

Figure 4.5 indicates that 22.6 percent of the students have inadequate revision materials. This implies that activities such as group discussions might not take place successfully as revision materials are a guiding tool. The research findings show that 19.9 percent of the students practice poor study habits. This implies that students may focus more on rote learning rather than understanding concepts. The study further reveals that 18.1 percent of the students carry out few practicals. This means that they are not adequately exposed to hands-on activities and hence do not acquire sufficient manipulative skills.

The figure shows that 14.2 percent of the students indicated that they have inadequate apparatus in their schools. This implies that experiments may not be

conducted successfully hence students will not learn how to observe, manipulate, measure, reason and develop skills for gathering information. Other challenges indicated by the students included negative attitude towards biology, hard terminologies, teachers absenteeism, lack of discussion groups, lack of regular tests, failure to complete syllabus, failure to ask questions whenever one does not understand a concept as well as lack of self esteem. The findings of this study are in agreement with the findings by Ombaso (2008) that inclusion of carefully selected activities was hindered by lack of sufficient time for preparation and large class sizes.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter provides a summary of the study, summary research findings, conclusions and recommendations as well as suggestions for further research.

5.2 Summary of the study

The purpose of this study was to investigate the influence of learner-centred strategies on students' biology performance in Kenya Certificate of Secondary Education in Kinangop Sub-county of Nyandarua County. The study aimed to answer four research questions that is to what extent does the activity centred student centre experiment and improvisation strategy influence students' performance in biology in Kinangop sub-county? To what extent does Plan Do See Improve strategy influence students' biology performance in KCSE? To what extent do teachers attitude towards learner-centred strategies influence students KCSE performance in biology? What are the challenges of implementing learner centred strategies in Biology in Kinangop sub-county secondary schools?

The study adopted descriptive research design. The target population for the study was 15 public secondary schools in Kinangop sub-county. The schools had 32 biology teachers. 20 biology teachers from 10 public secondary schools and 230 students participated in the study. Four teachers and 20 students were used for piloting. Data was collected by researcher using self-administered questionnaires for biology teachers and students. A correlation coefficient of the research instrument was found to be 0.88 and 0.92 for teachers and students respectively. The questionnaires were therefore considered reliable, statistical package for

social sciences was used to tabulate code and process data into a database because it is able to handle large amounts of data.

5.3 Summary of Research findings

The main findings of the study on the ASEI practice were that majority of the teachers engage students in a variety of activities during the learning/teaching process. The study showed that 55 percent of the teachers gave class demonstrations frequently. Half of the teachers under study indicated that they organize group discussions regularly; According to SMASSE (2004) group discussions provide students with opportunities to express opinions and explain ideas based on their prior experiences. Most teachers carry out small scale experiments though only 5 percent do them daily. The biology teachers rarely engage students in project work. The study showed that 30 percent of the teachers improvised in experiments while 70 percent rarely. This denies the students a chance to raise their interest and curiosity. The use of teaching aids such as models and charts is almost fully achieved. The study indicated that 80 percent of the teachers use them almost daily while 10 percent of the teachers rarely use them.

All the teachers under study indicated that they never organize field trips/ecological studies. The study indicated that 75 percent of the teachers rarely involved students in designing of experiments while the rest do involve them.

The main findings of the study on the PDSI approach and performance in biology were that majority of the teachers were not preparing ASEI lesson plan. It was further noted that only 5 percent of the teachers were preparing ASEI lesson plans

for every lesson as prescribed during the SMASSE in-service training. The majority of the teachers considered learners' background before planning, however 20 percent of the teachers indicated never. Use of students' suggestions for teaching is still being attained by most of the teachers. Students were allowed to report their findings by their teachers. A few teachers allowed their students to evaluate their lesson. This makes it impossible for the teachers to integrate the feedback in subsequent lessons. The biology teachers use students' feedback to improve their lessons. The teacher make use of feedback to modify the lesson as it progresses in order to eliminate misconceptions as well as improve subsequent instruction (CEMASTEA, 2012).

The findings of the study on teachers' attitude and performance in biology were that majority of the teachers felt that an ASEI lesson plan was difficult to prepare even after undergoing the SMASSE in-service training. The study revealed that teachers still felt that a lot of time was required to prepare comprehensive lesson notes. Majority of the teachers disagree with the statement that there were inadequate facilities for one to do practical. The study also showed that the teachers appreciate the value of teaching and learning activities though they felt it was not possible to have an activity in every lesson. A majority of the teachers did not attribute low performance to low entry behaviour. The teachers agree that evaluation is very necessary for effective teaching and learning. Most of the teachers agree that having a variety of activities during the lesson delays syllabus coverage. The study showed that most teachers indicated that immediate follow up of assignments enhances academic performance. This data indicates that the

attitude of the teachers towards implementation of learner centred strategies is yet to be fully achieved.

The main findings of the study on challenges of implementing ASEI/PDSI approaches were that the biology teachers identified lack of sufficient time as one of the major challenges in the implementation of ASEI/PDSI approach. Large class size and cited as a challenge by 85 percent of the teachers. This denies the students the opportunity to be given individual attention. The majority of the teachers indicated that heavy teaching load hindered their effective implementation of ASEI/PDSI approach especially lesson planning. Seventy five percent of the biology teachers agreed that low morale among teachers contributed to the failure to involve students in a variety of activities during the lessons.

Too long syllabus was not a cause of teachers' inability to implement the knowledge and skills acquired during the SMASSE training. The teachers have pressure to cover syllabus within the time stipulated by the school administration. This prompts the teachers to use teacher-centred methods of teaching and learning such as lecture method and teacher demonstration. Low entry behaviour was responsible for the slow adoption of ASEI/PDSI approaches by teachers. They argued that students with low entry behaviour had language barrier and were slow in grasping concepts. Most schools in the sub-county have a laboratory assistant hence lack of laboratory assistant is not a challenge to effective implementation of learner- centred strategies. Majority of the teachers did not attribute their failure to practice learner centred strategies to lack of supervision either by school administrators, the SMASSE INSET coordinators or Quality Assurance and standards officers. Majority of the biology teachers indicated that presence of

mischievous students in their respective stations did not hinder from imparting knowledge and skills to their learners through ASEI/PDSI approach.

5.4 Conclusions

From the findings of the study it can be concluded that the Activity Student centred Experiment and Improvisation (ASEI) strategy has not fully enhanced students' performance in biology as was expected. This is because its implementation by in-serviced teachers has not taken root. Teachers have failed to embrace hands on activities and instead have reverted back to teacher-centred methods of teaching such as lecture method and teacher demonstrations. The effective implementation of Plan Do See Improve (PDSI) strategy is still in the process of being attained. Teaching and learning of biology has not been as effective as it should be due to poor or inadequate planning. Failure of the majority of the biology teachers to prepare and use lesson plans in every lesson is a major setback in the implementation of learner centred strategies.

The biology teachers' attitude towards implementation of learner centred strategies is positive and is still attaining. Their attitude has changed as compared to the report of the baseline studies carried out 1998, which reported it as negative (SMASSE, 1999). Implementation of learner centred strategies in biology in the Kinangop Sub-county secondary schools has been faced by numerous challenges. Some of those challenges are within SMASSE's scope of operation while others are beyond SMASSE. Failure to address above the challenges has resulted to low morale and poor performance causing the biology mean score to remain below average.

5.5 Recommendations

Based on the findings and conclusions of the study the following recommendations were made:

(i) Research findings indicated that the ASEI strategy has not been fully implemented. In view of this monitoring and evaluation by SMASSE coordinators in liaison with the quality Assurance officers should be intensified to assess whether or not they are achieving their objectives in the field. The findings of the evaluation should be analysed and discussed during the proceeding SMASSE INSET. To enhance attendance of SMASSE in service training a fixed calendar should be put in place. In addition a mop-up in-service course should be organized for those who fail to attend some sessions due to one reason or the other. This will raise the morale of the concerned teachers as they will feel that their individual needs are catered for. To ensure that all teachers attend SMASSE INSET, it should be made mandatory by the teachers' service commission. This would ensure uniform exposure of information to all teachers. Teachers should organise students into permanent discussion groups right from form one to enable them carryout experiments, improvisation and ecological studies with ease. The groups should always be provided with work sheets whenever there is an activity to be performed. This will enhance team work and provide a forum for students to share experiences.

(ii) Failure of most teachers to implement PDSI strategy implies that they have not "owned" the SMASSE in-service training. There is therefore need to involve teachers at all levels of planning and implementation of SMASSE INSET.

Research findings indicated that majority of the teachers do not prepare lesson plans. It is recommended that the ministry of education in conjunction with CEMASTEA provide prepared lesson plans for all the topics so that teachers can have uniform material to refer to during the teaching. To entice teachers to write lesson plans, the school administration should provide each teacher with lesson plan books that have ASEI lesson plan format. Also any teacher who wishes to attend interviews for promotion either to higher job group or administrative post should be asked to submit the updated lesson plan books.

(iii) To enhance teachers' attitude towards ASEI/PDSI strategies the sub-county Education Board should introduce annual rewards for teachers who practice the learner-centred strategies. Regular workshops should be organized to sensitize teachers on how to practice ASEI/PDSI strategies within the prevailing situations. During workshops an open forum should be encouraged to enable participant share their experiences and come up with home grown solutions to their problems.

(iv) The study findings indicated that there is still a variety of challenges that hinder implementation of ASEI and PDSI strategies. The challenge of heavy teaching load should be addressed by the schools' board of management (BOMs) through hiring of trained teachers to supplement the ones posted by the Teachers Service Commission. The government should also increase budgetary allocation for the ministry of education to facilitate hiring of more teachers. The Kenya Institute of Curriculum Development should revise the biology syllabus to reduce its contents leaving the most relevant topics to allow completion of the syllabus and adequate testing and revision.

5.6 Suggestions for further research

There is need for further research to be conducted in the following areas:

(i) An in-depth study to assess the influence of learner-centred strategies on biology performance in the entire Nyandarua County. This is vital because there are historical, geographical, institutional and other differences between sub-counties.

(ii) Further research should be done to identify institutional factors that hinder implementation of learner –centred strategies.

(iii) A study to be conducted assessing the influence of learner – centred strategies in performance of other science subjects and mathematics on Kinangop sub-county. This is because SMASSE INSET involved the training of teachers of other sciences and mathematics as well.

(iv) The study did not focus on influence of learner-centred strategies in private schools; this would be a rich area for research.

(v) There is need to carryout studies, which would address the issues, pertaining to other teaching methodologies that could be effective in improving biology performance.

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APPENDICES

APPENDIX A

LETTER OF INTRODUCTION

University of Nairobi

Kikuyu Campus

P.O. Box 92

KIKUYU

Dear Sir/Madam,

RE: Influence of Learner-centred Strategies on Students' Biology performance in Kenya Certificate of Secondary Education in Kinangop Sub-county, Nyandarua county, Kenya

I am a post graduate student in the Department of Educational Administration and Planning at the University of Nairobi. I am carrying out a research on the above stated topic. Your school has been selected to take part in the study. I kindly request your permission to gather the required information from your institution. The questionnaires are designed for this research purposes only, therefore no name of respondent will be required.

Thank you in advance for your anticipated co-operation.

Yours sincerely,

Michael Mwangi Gituthu

E55/62484/2010

APPENDIX B

QUESTIONNAIRE FOR BIOLOGY TEACHERS

The purpose of this study is to investigate the influence of learner- centred strategies on students' biology performance in Kenya certificate of secondary education in Kinangop Sub-county, Nyandarua County. You are kindly requested to answer the questions as honestly as possible. Do not indicate your name on this questionnaire. Your responses will be treated confidentially. Please put a tick in the appropriate bracket or fill in the information in the blank spaces provided.

Section A: Background information

1. What is your gender? Male ( ) Female ( )

2. What is your highest professional qualification?

   PhD ( ) Masters ( ) B. Sc ( ) B. Ed ( ) Diploma ( )

3. What is your age?

   20-29years ( ) 30-39years ( ) 40-49years ( ) 50-60years ( )

4. For how long have you been teaching?

   1-5 years ( ) 6-10 years ( ) 11-15 years ( ) Above15 years ( )

5. How many lessons do you have in a week?

   4-10 ( ) 11-18 ( ) 19-24 ( ) Above 24 ( )

6. a. Have you attended the SMASSE INSET? Yes ( ) No ( )

   b. If yes, how many cycles have you attended?

   1 ( ) 2 ( ) 3 ( ) 4 ( )

7. How many years have you taught in your current station?

   Less than 1 ( ) 1-5 ( ) 6-10 ( ) 11-15 ( ) Above 15 ( )

Section B: The ASEI Practice

8. How often do you perform the following activities in teaching biology?

	Statement	Daily	Weekly	Monthly	Termly	Never
i.	Engage students in a variety of activities					
ii.	Give class demonstration					
iii.	Organize group discussion					
iv.	Carry out small scale experiments					
v	Engage students in project work					
vi.	Improvise in experiments					
vii.	Use teaching aids such as models and charts					
viii.	Organize field trips/ecological studies					
ix.	Involve students in designing experiments					

Section C: The PDSI approach

9. How often do you perform the following activities in teaching biology?

	Statement	Daily	Weekly	Monthly	Termly	Never
i.	Prepare an ASEI lesson plan					
ii.	Considers learners' background before planning					
iii.	Use students' suggestions for teaching					
iv.	Allow students to report their findings					
v.	Allow students to evaluate your lesson					
vi.	Use students' feedback to improve your lesson					

Section D: Attitude

10. To what extent do you agree with the following statements?

	Statement	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
i.	An ASEI lesson plan is difficult to prepare					
ii.	A lot of time is required to prepare comprehensive lesson notes					
iii.	My students rarely give correct answers					
iv.	My school has inadequate facilities for one to do practicals					
v.	It is not possible to have an activity in every lesson					
vi.	My students do not perform due to low entry behaviour					
vii.	Evaluation is very necessary for effective teaching and learning					
viii.	Having a variety of activities during the lesson delays syllabus coverage					
ix.	Immediate follow-up assignments enhance academic performance					

Section E: Challenges of implementing ASEI/PDSI

11. The following is a list of challenges faced by biology teachers in the use of ASEI-PDSI approach in teaching. Kindly indicate your level of agreement.

	Challenge	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
i.	Lack of sufficient time					
ii.	Large class size					
iii.	Heavy teaching load					
iv.	Low morale among teachers					
v.	Syllabus too long					
vi.	Pressure to cover syllabus					
vii.	Low entry behaviour					
viii.	Lack of laboratory assistant					
ix.	Lack of supervision					
x.	Mischievous students					

xi. Others (specify)……

Thank you for your participation

APPENDIX C

QUESTIONNAIRE FOR BIOLOGY STUDENTS

The purpose of this study is to investigate the influence of learner-centred strategies on students' biology performance in Kenya certificate of secondary education in Kinangop sub-county, Nyandarua County. You are kindly requested to answer the questions as honestly as possible. This questionnaire is for the purpose of research only. Do not write your name anywhere. The responses shall be absolutely confidential. Please put a tick (√) in the appropriate bracket or fill in the information in the blank spaces provided.

Section A: Background information

1. Are you currently in form four? Yes ( ) No ( )
2. What is your gender? Male ( ) Female ( )
3. What is your School status? Boys ( ) Girls ( ) Mixed ( )
4. What is your school's boarding status? Boarding ( ) Day ( ) Mixed ( )
5. Are you a boarder or a day scholar? Boarder ( ) Day scholar ( )
6. How many marks did you score at KCPE?

   351-500 ( ) 320-350 ( ) 290-319 ( ) 260-289 ( ) Below 250 ( )
7. What is your current performance in biology?

   0-20 ( ) 21-49 ( ) 50-69 ( ) 70-79( ) 80-100( )

Section B: The ASEI practice

8. How frequently do you perform the following activities in biology?

	Statement	Daily	Weekly	Fortnightly	Termly	Yearly
i.	Individual experiment					
ii.	Group discussions					
iii.	Observe teacher demonstration					
iv.	Go for field trips					
v.	Carry out ecological studies					
vi.	Do project work					
vii.	Do peer teaching					

Section C: The PDSI approach

9. How often do you do the following things during the biology lessons?

	Statement	Daily	Weekly	Fortnightly	Termly	Yearly
i.	Participate in lesson preparation					
ii.	Give suggestions during the lesson					
iii.	Report your findings					
iv.	Comment on the lesson delivery					
v.	Ask questions on unclear concepts					
vi.	Share your experience with others					

Section D: Attitude

10. To what extent do you agree or disagree with each of the following statements?

	Statement	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
i.	Working with living organisms in biology is very interesting					
ii.	Discussion helps me share ideas with other students					
iii.	I understand biology concepts better during peer teaching					
iv.	Field trips enable me to appreciate biology as part of real world					
v.	When involved in an experiment it develop scientific skills					
vi.	Project work enables me to engage in scientific investigation of my choice					
vii.	I gain a lot by participating in a teacher demonstration					

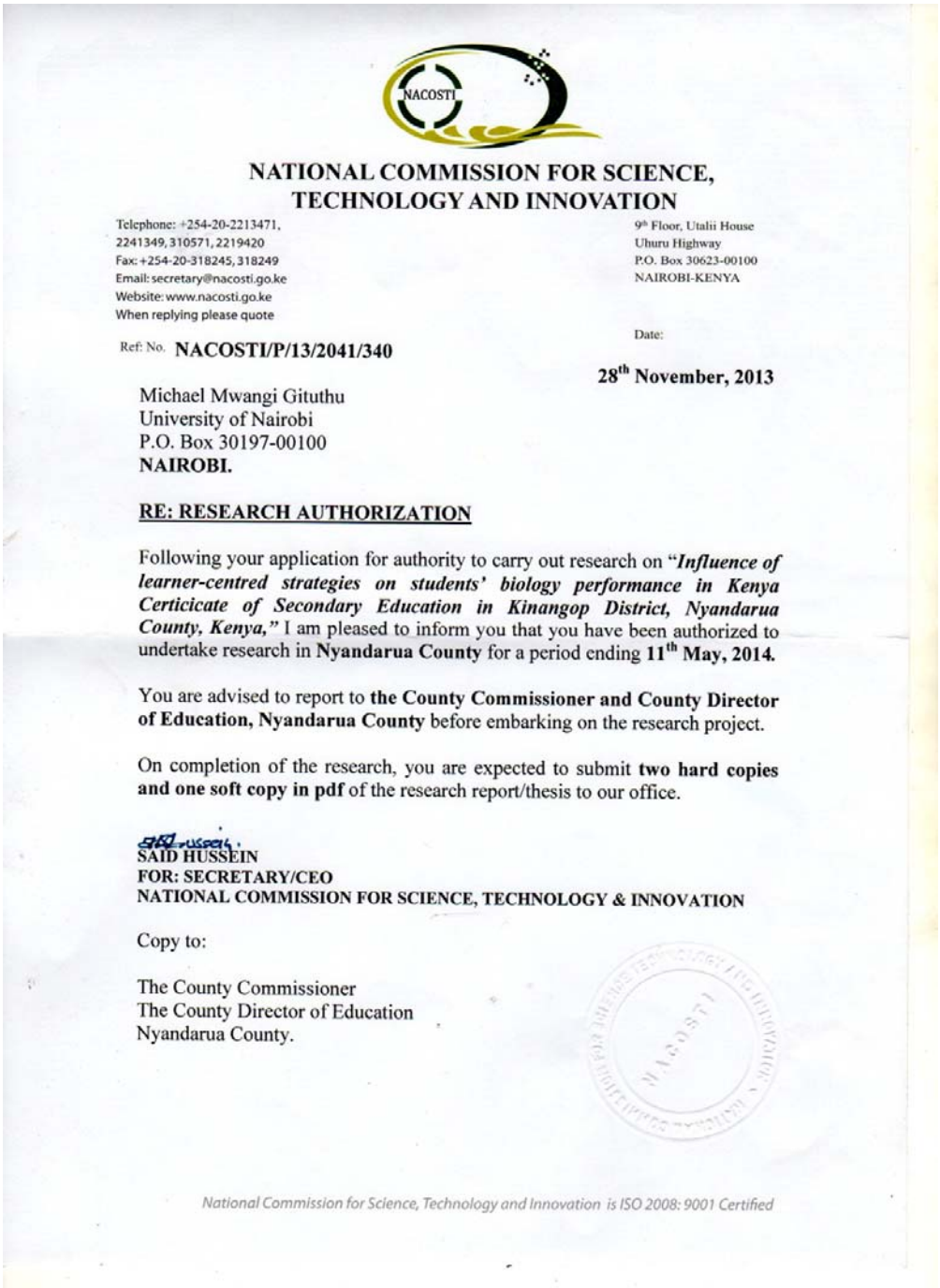
Section E: Challenges of implementing ASEI/PDSI

11. What problems do you face in the learning of biology?

Thank you for your participation

APPENDIX D

RESEARCH AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/13/2041/340**

Date:

28th November, 2013

Michael Mwangi Gituthu
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Influence of learner-centred strategies on students' biology performance in Kenya Certicicate of Secondary Education in Kinangop District, Nyandarua County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nyandarua County** for a period ending **11th May, 2014.**

You are advised to report to **the County Commissioner and County Director of Education, Nyandarua County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

SAID HUSSEIN
FOR: SECRETARY/CEO
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Copy to:

The County Commissioner
The County Director of Education
Nyandarua County.

National Commission for Science, Technology and Innovation is ISO 2008: 9001 Certified

APPENDIX E

RESEARCH CLEARANCE PERMIT

THIS IS TO CERTIFY THAT:
MR. MICHAEL MWANGI GITUTHU
of UNIVERSITY OF NAIROBI, 140-20319 south kinangop,has been permitted to conduct research in *Nyandarua County*

on the topic: *INFLUENCE OF LEARNER-CENTRED STRATEGIES ON STUDENTS' BIOLOGY PERFORMANCE IN KENYA CERTIFICATE OF SECONDARY EDUCATION IN KINANGOP DISTRICT, NYANDARUA COUNTY, KENYA*

for the period ending:
11th May,2014

.....
Applicant's Signature

Permit No : NACOSTI/P/13/2041/340
Date Of Issue : 28th November,2013
Fee Recieved : Kshs khs1000.00

.....
Secretary
National Commission for Science, Technology & Innovation

CONDITIONS

1. **You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
2. **Government Officers will not be interviewed without prior appointment.**
3. **No questionnaire will be used unless it has been approved.**
4. **Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
5. **You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
6. **The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice**

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 7734

CONDITIONS: see back page